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A NEW SPECIES OF PAPILIO FROM THE EASTERN UNITED STATES (PAPILIONIDAE)

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ABSTRACT

A new species *Papilio joanae* is described. The male and female types, a mature larva, and the male genitalia are figured. The type locality is Warsaw, Missouri in forested areas. This multivoltine species differs from its nearest relatives *Papilio polyxenes asterius* Stoll, 1782 and *Papilio bairdii* Edwards, (1867) in wing pattern characteristics and differences in color and pattern of the larvae. The presently known range is restricted to forested areas in the Missouri Ozarks. The larvae feed on wild species of APIACEAE. The male and female types have been deposited in the American Museum of Natural History.

INTRODUCTION

SINCE 1962 A POPULATION has been studied of a *Papilio* species occurring in the thickly forested areas of the Missouri Ozarks. In general appearance the adults resemble *Papilio polyxenes asterius* Stoll, 1782. Because of behavioral and habitat differences exhibited by the adults, a number of genitalic preparations were made of both sexes to see if any differences were apparent between the forest populations and the open field and garden species *asterius*. Individual variation was found in both species but only vague structural differences by which the open field and forest populations could be separated. In a way this was to be expected since Rothschild and Jordan (1906) could find no recognizable differences in the genital armature of members of the *machaon* group with the exception of *Papilio indra* Reakirt, 1866. Several attempts were made over the years to rear specimens of the forest populations but without success. Females taken and confined with the favorite *asterius* foodplants of the area (carrot, dill, parsnips, and wild carrot) refused to lay on any of these plants although *asterius* females will almost always

oviposit freely on them. Finally, in June 1972 two small parasitized *Papilio* larvae were found on a plant later identified as *Taenidia integerrima* (L) Drude (APIACEAE). This plant gives off a strong pungent odor when brushed or handled roughly. No other females were collected in 1972 but on 29 April 1973 a female was taken near Warsaw, Missouri and when confined over this plant oviposited freely; a fine series of adults emerged in early June. *T. integerrima* dries up by late July but in early August 1973 ova and larvae in all instars were found on another woodland APIACEAE species *Thaspium barbinode* (Michx.) meadow parsnip. The larvae, especially in the final instar, are distinctive when compared with *asterius* larvae. A forthcoming paper will describe the life history in detail. With this large series of specimens for study, consistent pattern differences soon became apparent between this species and *asterius*.

Twelve names, all considered to be infrasubspecific, are currently associated with *P.p. asterius*. *P. asterius* var. *ampliata* Ménétriés, 1857 is a very dark form described from Mexico which has the inner row of spots obsolete in both sexes. It is a fairly common form in some Texas populations of *asterius* but is rare further north. *P. calverleyi* Grote, 1864 is an aberrant form with greatly expanded yellow areas on both wings. It occurs in both sexes. *P. asterioides* Reakirt, 1866 is another very dark form described from Mexico and probably synonymous with *ampliata*. *P. asterius* var. *alunata* Skinner and Aaron, 1889 is a female form which has the submarginal spots nearly absent. *P. asterius* var. pupae *viridis* Cockerell, 1889 was a name proposed for the green pupal form of *asterius*. *P. asterius* var. *semi-alba* Ehrmann, 1900 is an aberrant male form with forewing markings white instead of yellow. *P. polyxenes* var. *curvifascia* Skinner, 1902 usually lacks the discal cell spot of the hindwings. The yellow bands of the dorsal surface are large in both sexes. It was described from New Mexico but the name has been frequently applied to eastern *asterius* males which lack the discal cell spot on the hindwings. *P. asterius* ab. *ehrmanni* Ehrmann, 1925 is a male aberration with greatly reduced markings resembling the normal female pattern. *P. asterius* ab. *streckeri* Holland, 1927 is a common female form in which the cell spot of the hindwings is missing on the ventral surface. *P. polyxenes* ab. *forsythae* Wood, 1937 is a form with the

yellow bands much wider than normal *asterius*. *P. ajax* form *pseudoamericus* Brown, 1942 is a male aberration with yellow bands extending inward to the base of the hindwings. *P. polyxenes asterius* form *subamplicata* Dufrane, 1946 is a female form with yellow spots of the medial band missing on the hindwings. This form is not uncommon in late summer broods of *asterius*. An examination of original descriptions, type photographs, or types where possible has shown that none of these names can be applied to this new species which is now described.

***Papilio joanae* J. R. Heitzman, new species**

MALE: Dorsal surface: Ground color charcoal black. Forewing with a narrow yellow dash between veins along the outer margin. There is a row of rounded submarginal spots with the spot in cell CU2 very small. There is another row of larger yellow postmedian spots with basally tapering inner edges; the spot at the inner margin is reduced in size or nearly absent; the apical spot in this band is short and does not taper basally. Occasionally there is a faint yellow subapical spot and a faint yellow bar at the outer edge of the cell. Hindwings with marginal dashes slightly wider than those of the forewings. Submarginal yellow spots larger and slightly crescent shaped. The postmedial band of yellow spots is composed of various sized spots, mostly crescent shaped and slightly tapered basally. The cell area usually has only a faint trace of a yellow spot. Between the submarginal and postmedial spot bands there is a complete row of bright, powder blue spots; the one above the anal eye spot crescent shaped; the eye spot at the anal angle encloses a black pupil which in most cases connects with the inner or anal margin or both; color above pupil burnt orange, below pupil bright yellow. Tails black. Head black with two small yellow dots on the dorsal surface. Antennae black. Palpi black with white base. Thorax black; patagia black with a very faint yellow edging. Abdomen black with two rows of small yellow spots along each side; ventral surface of abdomen with two partial rows of small yellow spots. Legs and ventral surface of thorax and abdomen black.

Ventral surface: Pattern of the dorsal surface repeated but with the postmedial yellow bands of both fore and hindwings replaced almost entirely by orange. The submarginal bands of yellow spots are also partially replaced with orange. The band of blue spots is concentrated into small bright spots near the outer edge of the postmedial band; beyond the blue spots there is a scattering of

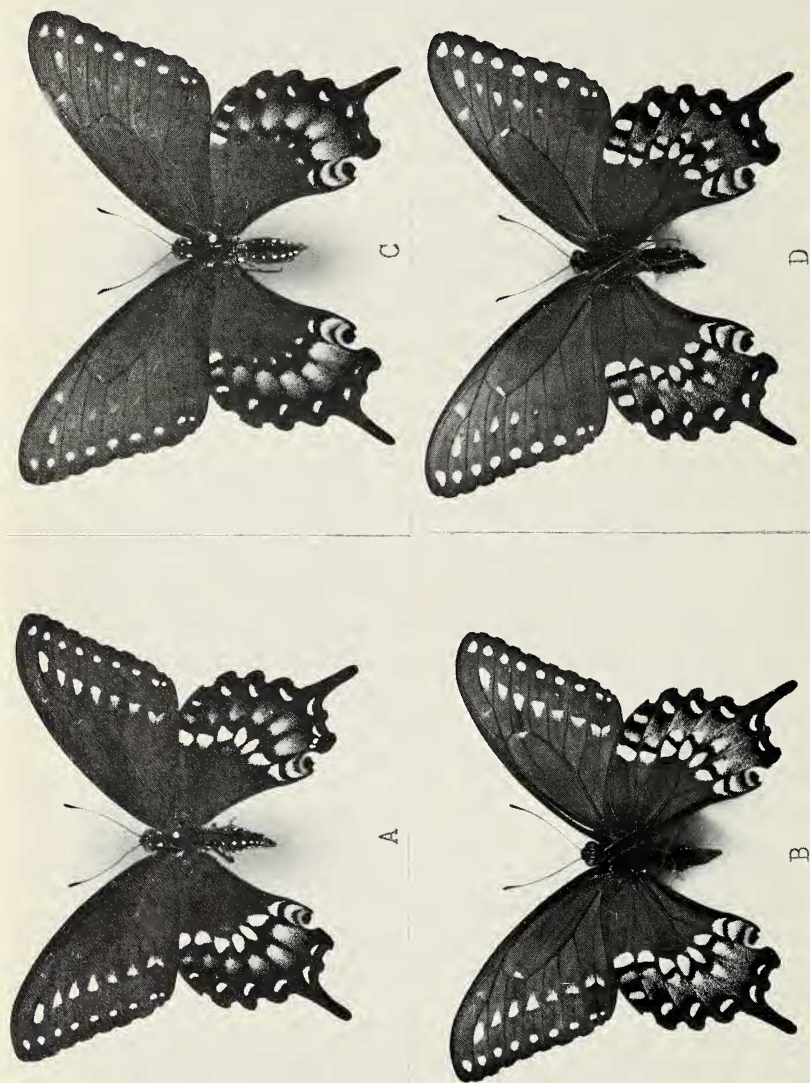


Fig. 1. (A) *Papilio joanae*, new species, holotype male, Warsaw, Missouri, 10 June, 1973 (J. R. Heitzman) X 2/3.

(B) Underside of holotype.

(C) Allotype, female, same data as holotype. X 2/3.

(D) Underside of allotype.

blue scales covering the area occupied by the blue spots of the dorsal surface.

FEMALE: Like the male but with the yellow bands reduced in size, especially the postmedial bands which are frequently nearly absent on both fore and hindwings above. The blue spot bands of the hindwings are enlarged. The anal eyespot has more orange than yellow. The postmedian spot bands on the ventral surface are usually entirely orange.

FOREWING LENGTH OF TYPE SERIES: Spring brood: Average for 43 males 38.7 mm, range 35.5–43.0 mm; for 15 females 41.6 mm, range 39.0–46.0 mm. Summer broods: Average for 80 males 46.6 mm, range 43.0–50.0; for 51 females 50.4 mm, range 44.0–54.5 mm.

GENITALIA: The genitalia of both sexes show a wide range of individual variation but the only fairly consistent difference as compared to *asterius* seems to be a slightly different configuration of the valves. The genitalia alone cannot be relied upon for determining this species.

TYPES: Holotype, male, Warsaw, Benton County, Missouri, Elevation 800-880 feet, 10 June 1973 (J. Richard Heitzman); allotype female, same data as holotype; paratypes; imagines, 128 males and 68 females; larvae, 18 specimens; pupae, 3 specimens. Data as follows; eight males and one female, 25 April 1961; four males, 26 April 1962; one male 1 July 1962; one male, 13 August 1962; one male, 7 April 1963; six males, 14 April 1963; two females, 1 May 1963; seven males, 20 April 1965; one male and one female, 20 April 1969; four males and one female, 26 April 1970; four males and two females, 3 May 1970; eight males and four females, 23 April 1971; one female, 23 April 1972; one male and two females, 29 May 1971; one male, 25 May 1971; one male 27 May 1971 (J. Richard, Roger, Robert, Joanie, and Brenda Heitzman); one female, 29 April 1973; two males and one female, 10 June 1973; one female, 15 July 1973; nine males and two females, 8 August 1973; three males and one female, 14 August 1973; one male, 2 September 1973 (J. Richard Heitzman); one male and one female, 23 April 1972; one male, 10 August 1973; three males and one female, 11 August 1973 (Richard S. Funk); ex ova from female taken 29 April 1973; two males, 31 May 1973; seven males and three females, 1 June 1973; five males and three females, 2 June 1973; eight males and five females, 3 June 1973; nine males and three females, 4 June 1973; eight males and two females, 5 June

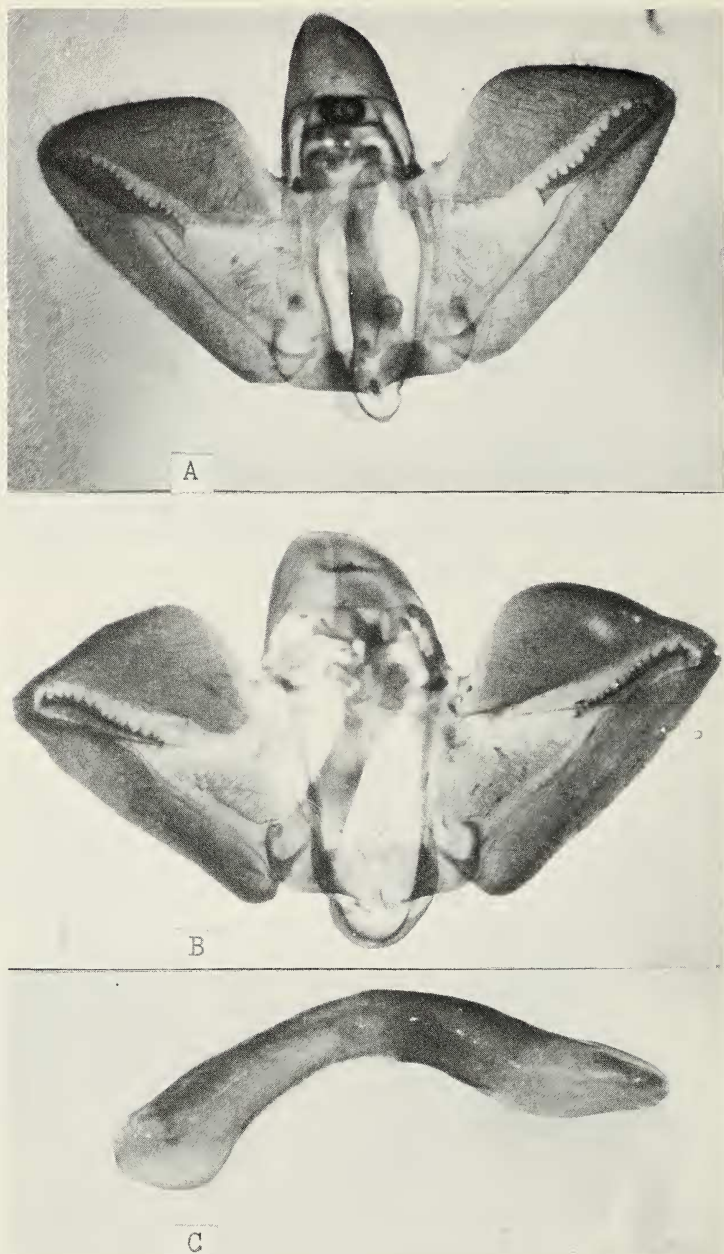


Fig. 2 Male genitalia. (A) *Papilio p. asterius*, Warsaw, Missouri, ventral view.

(B) *Papilio joanae*, new species, holotype, ventral view.

(C) Ventrolateral view of aedeagus of holotype.

1973; seven males and six females, 6 June 1973; two females, 9 June 1973; one female, 11 June 1973; one first instar, one second instar, one third instar, one fourth instar, and four fifth instar larvae; three pupae; ex ova from female taken 15 July 1973; one male, 11 August 1973; one male, 12 August 1973; one male and one female, 13 August 1973; five males, 14 August 1973; one female, 15 August 1973; two females, 16 August 1973; ex larvae collected 14 August 1973; one female, 27 August 1973; one male and one female, 28 August 1973; three males, 29 August 1973; two males and one female, 30 August 1973; two males and two females, 31 August 1973; 1 male, 1 September 1973; five males and six females, 2 September 1973; one female, 3 September 1973; three males and one female, 4 September 1973; one female, 5 September 1973; one fourth instar and eleven fifth instar larvae collected 14 August 1973. All paratype specimens from Warsaw, Benton County, Missouri.

TYPE LOCALITY: Warsaw, Benton County, Missouri, elevation 800-880 feet, in forest area.

In addition to the type series specimens have been examined from localities in Camden, Carter, Franklin, Johnson, Knox, Maries, St. Louis, and Washington Counties in Missouri.

LOCATION OF TYPES: The holotype and allotype will be deposited in the type collection of the American Museum of Natural History. Paratypes will go to the following institutions and individuals: The Florida State Collection of Arthropods, Gainesville, Florida; The Entomology Museum of the University of Missouri, Columbia, Missouri; Richard S. Funk, Southern Illinois University, Edwardsville, Illinois; Dr. Cyril F. dos Passos, Mendham, New Jersey; Dr. Alexander B. Klots, Putnam, Connecticut; Dr. Herman Flaschka, Georgia Tech University, Atlanta, Georgia; and the Heitzman collections, Independence, Missouri.

ETYMOLOGY: I take pleasure in naming this species for my wife Joanie Heitzman who for over 20 years has answered with a smile all the idiocrasies of a Lepidopterist husband.

DISCUSSION

The nearest allies of *Papilio joanae* are *asterius* and *P. bairdii* Edwards (1867). The males of *joanae* are much darker than *bairdii* males; most female *bairdii* are as dark as *joanae* on the dorsal surface but much lighter on the undersides. From *asterius*, *joanae* can best be told by the habitat where they occur, differences in the larvae, and



A



B

Fig. 3. Final instar larvae. (A) *Papilio joanae*, new species, paratype
(B) *Papilio p. asterius*, normal color form. from Warsaw, Missouri.

adult pattern characteristics as follows. Males: dorsal surface; the apical spot of the postmedial yellow spot band is single and fairly short, on *asterius* it is usually longer and or broken into two spots. The submarginal yellow spots of *joanae* are usually round while on *asterius* the lower spots are frequently oblong. The blue spot band on the hindwings of *joanae* is complete while on *asterius* there are usually only a few blue spots in the anal area of all but the spring brood. The anal eyespot of most *asterius* has a black central pupil, on most specimens of *joanae* this pupil will touch the inner or anal margin of the wing. Females: On *joanae* females the costal spot of the postmedial band of the hindwings above is small and obscured while on *asterius* it is usually rather prominent. In both sexes the postmedial bands of the ventral surfaces normally have more orange than those of *asterius*; the fifth spot from the costal margin of the postmedial bands of the hindwings are often no longer than spot four while on *asterius* the fifth spot is frequently twice as long as the fourth spot.

P. p. asterius occurs within the type locality of *P. joanae* but is confined to the road edges where flourishing colonies exist on an abundant growth of wild carrot (*Daucus carota*). Adult males of the two species seemingly ignore one another when coming in contact while actively engaging members of their own species.

ACKNOWLEDGMENTS

I am grateful to Richard S. Funk for his help over the last three years in locating new colonies of *P. joanae* and obtaining living material for this study. Dr. Warren Wagner has given valuable field assistance and determined associated flora. Dr. Cyril F. dos Passos has given helpful criticism regarding the manuscript and helped in obtaining several of the original descriptions and making translations where necessary. Dr Alexander B. Klots has given helpful suggestions regarding the manuscript. The Missouri State Park Board has kindly furnished collecting permits for the Missouri State Parks. Dr. Wilbur Enns has made available for study all the specimens contained in the Missouri University Collection. Last but by no means least I am indebted to my wife Joanie, my sons Roger and Robert, and my daughter Brenda for untold hours in the field locating and procuring specimens and searching for larvae and host plants.

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